

the fees), which is about the average of the stipends in the colleges recently established; and that of each lecturer at £50. per annum. A further sum will be required for class expenses and for the general expenses of the college. A college consisting of the staff recommended would therefore require a permanent income of at least £3,000. per annum, necessitating a capital of £75,000. This estimate does not include the cost of erecting any building for the purposes of the college, or the rent which might have to be paid for the necessary accommodation pending such erection. The committee suggest the desirability of deferring for the present the question of the government of the college, and they recommend that the management be placed in the meantime in the hands of a committee to be appointed by the adjourned town's meeting. The report was adopted and a committee appointed to carry out its objects.

A MEETING was held on Monday, in the City, for the purpose of formally constituting the "City and Guilds of London Institute for the Advancement of Technical Education." The meeting was, in fact, the first held by the Board of Governors which the provisional committee of the Guilds had recommended should be constituted as the supreme governing body of the new institute. This body consists of representatives from the subscribing Livery Companies, nominees from the Court of Common Council, the Lord Mayor, and other City officials, with a president and twelve vice-presidents. The amount of available income already promised is over £12,000., but it is anticipated that as soon as any actual progress is made in the work, contributions will be given by the companies who have not yet joined in the scheme. The proposals which the committee have before them include the establishment in London of a central technical school, the establishment and assistance of evening classes, trade schools, &c., and the development of a system of technical examinations such as that now carried on by the Society of Arts. All these proposals were made in the provisional committee's report, and it was proposed to carry them all into execution as soon as sufficient funds were obtained. It was stated at the meeting on Monday that the Commissioners of the 1851 Exhibition were proposing to erect a building at South Kensington in which would be included a technical school, and it was, therefore, understood that either some arrangement would be come to with them or the execution of the proposals connected with the London school would be deferred till it was definitely known what direction the action of the Commissioners would be likely to take. It may be assumed, therefore, that the proposals of the executive committee will embody the other recommendations of the provisional committee, and will include a detailed scheme for carrying them out.

THE New South Wales correspondent of the *Colonies* states that, in consideration of the necessity which is now felt for extending the curriculum of Sydney University and augmenting its teaching powers, the Colonial Government have consented to ask Parliament for an additional annual grant of £5,000. This will enable the Senate to make the following additions to the present course of study:—Mental philosophy, law, history, and English literature; (2) all the education necessary for the medical profession; (3) a complete course of natural philosophy, coupled with mechanics and engineering; (4) the addition of organic chemistry and metallurgy to the chemical school; and (5) biology, including animal and vegetable physiology. The Senate will also be in a position to establish a faculty of science, and to confer the degrees of Bachelor and Doctor of Science, and also degrees in medicine, on those who have received their education in Sydney.

WE have received a "Calendar" of Anderson's College, Glasgow, containing much information as to the founder and the curriculum of that useful institution. It shows that a very complete and thorough education may be obtained there at a very moderate cost.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, November 5.—Mr. A. Grote, vice-president in the chair.—A communication received from Mr. J. H. Gurney, F.Z.S., contained a memorandum from the late Mr. E. C. Buxton, stating that *Asturinula monogrammica*, observed on the Eastern Coast of Africa, had a song which was heard morning

and evening.—An extract was read from a letter addressed to the Secretary by Dr. A. B. Meyer, C.M.Z.S., respecting a supposed new bird of paradise, obtained on the West Coast of New Guinea.—An extract was read from a letter addressed to the Marquis of Tweeddale by Mr. A. H. Everett, stating that the anoa of Celebes (*Anoa depressicornis*), or an allied species, was found in the Island of Mindoro, Philippines.—Prof. Newton, F.R.S., exhibited and made remarks on a supposed hybrid between the red grouse and ptarmigan, lately shot in Sutherland by Capt. Houston.—A communication was read from Mr. R. Bowdler Sharpe, F.Z.S., containing a description of a new species of *Indicator*, with remarks on other species of the genus.—A second paper by Mr. Sharpe contained a note on *Pooptera lugubris*.—A communication was read from Mr. G. B. Sowerby, Jun., wherein he gave the descriptions of ten new species of shells from various localities.—Mr. A. G. Butler, F.Z.S., read a paper in which he gave the description of a remarkable new spider, obtained in Madagascar by the Rev. W. D. Cowan, for which the name of *Carostris aernalis* was proposed.—A communication was read from Lt.-Col. R. H. Beddoe, C.M.Z.S., containing the description of six supposed new species of snakes of the genus *Silvatura*, family Uropeltidae, from the Peninsula of India.—A communication was read from Mr. Edgar A. Smith, F.Z.S., containing the description of a collection of marine shells, made by Capt. L. W. Wilmer, in the Andaman Islands.—Mr. F. Moore, F.Z.S., communicated a list of the lepidopterous insects collected by Mr. Ossian Limborg in Upper Tenasserim, with descriptions of new species.—Mr. George French Angas, C.M.Z.S., gave the descriptions of six species of bivalve shells in the collection of Mr. Sylvanus Hanley, F.L.S., and of a *Helix* from the Solomon Islands. Mr. Angas also read descriptions of ten species of Marine Shells from the Province of South Australia. Mr. Angas likewise read a list of additional species of marine mollusca to be included in the fauna of the Province of South Australia, with notes on their habitats and local distribution, in continuation of former papers on this subject.—Dr. G. E. Dobson read a note on *Myxopoda aurita*, a new form of chiroptera from Madagascar, remarkable for possessing suctorial disks, as in *Thyropygoptera*. Mr. Dobson also gave descriptions of some new or rare species of bats based on specimens in the Museum of Natural History of Paris. To the new species the following names were given:—*Pteropus germaini* from New Caledonia, *Cephalotes minor* from New Guinea, *Emballonura raffrayana* from Gibolo, and *Schistostoma brachyole* from Cayenne.

CAMBRIDGE

Philosophical Society, October 28.—Annual General Meeting, Prof. Living president, in the chair.—The following were elected Officers and new Members of Council for the ensuing year.—President, Prof. Living; Vice-Presidents, Prof. Stokes, Prof. Newton, and Prof. Clerk Maxwell; Treasurer, Dr. J. B. Pearson. Secretaries, Mr. J. W. Clark, Mr. Coutts Trotter, and Mr. J. W. L. Glaisher. New Members of Council, Prof. Humphrey, Prof. Cayley, Mr. W. M. Hicks.—Prof Cayley made a communication to the Society upon the transformation of co-ordinates. He investigated the formulae for the transformation between two sets of oblique co-ordinates in three dimensions, which, when presented in the notation of matrices, assumed a very elegant form. The paper also contained developments relating to certain expressions that were involved in the transformation.—Mr. J. W. L. Glaisher made a communication to the Society on Henry Goodwyn's "Tabular Series of Decimal Quotients" and "Table of Circles" (London, 1823). The first contains the value, to eight decimal places, of every vulgar fraction, whose numerator and denominator, when the fraction is expressed in its lowest terms, do not exceed 1000. This table, in which the fractions are arranged in order of magnitude, was intended to extend to $\frac{1}{2}$, but only the first part, which ends at $\frac{99}{99}$, was published. The "Table of Circles" contains all the complete periods corresponding to the denominators, prime to 10, up to 1024. The object of the tables was the conversion of vulgar fractions into decimals, the complete quotients being shown. In the first table the fractions are arranged in order of magnitude, and Mr. Goodwyn was thus led to a remarkable theorem, viz., that if all the fractions in their lowest terms having their numerators and denominators both not exceeding a given quantity n be arranged in order of magnitude, then each fraction is equal to the fraction formed by adding together the two numerators and the two denominators

of the fractions on each side of it. Thus if $n=5$, the fractions are $\frac{1}{5}, \frac{1}{4}, \frac{2}{5}, \frac{1}{3}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}$, and, for example, $\frac{1}{3} = \frac{1+2}{4+5}$; also the difference between any two consecutive fractions is equal to unity divided by the product of their denominators. These properties, discovered by Mr. Goodwyn, were afterwards proved by Cauchy. Mr. Glaisher pointed out the great convenience of the arrangement of the periods in Goodwyn's tables, and exhibited a table showing the number of periods corresponding to every denominator up to 1000, and the number of figures in each period. This table was obtained by actual counting from Goodwyn, and in every instance the product of the number of figures in each period and the number of periods was found to be equal to the number of numbers less than the denominator and prime to it, as should be the case. After alluding to other similar tables, and to tables by Gauss, Reuschle, Desmarest, Shanks, &c., reference was made to the fact discovered by Desmarest that the number of figures in the period of the reciprocal of 487^2 is the same as the number of figures in the period of the reciprocal of 487, or in other words, $10^{486} \equiv 1 \pmod{487^2}$. In vol. iii. of *Crelle Abel* proposed the query, "Can $x^{\mu-1} \equiv 1 \pmod{\mu^2}$, if μ be a prime and x less than μ^2 ?" Jacobi replied and showed that $3^{10} \equiv 1 \pmod{11^2}$, $14^{28} \equiv 1 \pmod{29^2}$ and $18^{36} \equiv 1 \pmod{37^2}$. The case found by Desmarest is the only one known in which the conditions of Abel's question are satisfied for $x=10$; in fact we have $10^2 \equiv 1 \pmod{3^2}$ and $10^{486} \equiv 1 \pmod{487^2}$, and there is no other known case in which $10^{\mu-1} \equiv 1 \pmod{\mu^2}$, μ being a prime, although there is no reason to suppose that such cases do not exist, and that there is not some value of μ for which $10^{\mu-1} \equiv 1 \pmod{\mu^2}$. Desmarest has verified that for values of μ less than 1000 the congruence $10^{\mu-1} \equiv 1 \pmod{\mu^2}$ is only satisfied for $\mu=3$ and $\mu=487$. Mr. Glaisher also exhibited the first fourteen printed pages of the factor table for the fourth million, an account of the construction of which was communicated to the Society on February 11, 1878.

PARIS

Academy of Sciences, November 4.—M. Fizeau in the chair.—The following papers were read:—Researches on the stability of the ground and of the vertical of Paris Observatory, by M. Mouchez. M. Wolf is occupied with the former question. M. Gaillot has been studying the latitude given at different epochs. The variations of a few tenths of a second in this, at different times of the year, are thought due to the influence of temperature either on the instruments, or (rather) on the astronomical refractions, whose coefficient has not yet been adequately determined; or they may be due to a systematic error of the declination of stars distributed regularly over the twenty-four hours of right ascension, these hypotheses being more admissible than that of a variation of the vertical.—On the reciprocal displacements between oxygen, sulphur, and halogen elements, combined with hydrogen, by M. Berthelot.—Reciprocal displacements between weak acids, by the same. Two weak acids opposed to each other divide the base, the division being regulated by the state of partial decomposition of the two salts dissolved, which depends both on the proportion of water and on that of the corresponding acid.—On the reaction between mercury and hydrochloric gas, by M. Berthelot. 13·5 gr. of mercury and 48 cub. cm. of pure hydrochloric gas put in a very resistant sealed glass tube and heated to the highest possible temperature for an hour, yielded a little over 1 cub. cm. of hydrogen, indicating decomposition of about one-twentieth of the hydrochloric gas.—Preliminary note on the compound nature of the chemical elements, by Mr. Lockyer. Besides calcium, several substances considered as elements are compounds.—On the native iron of Greenland and the basalt containing it, by Prof. Lawrence Smith. He gives an analysis of a memoir on the subject. He is convinced the iron is of terrestrial origin, and in many cases so intimately united with basalt that the felspathic and other crystals of the latter penetrate the iron particles. The iron is probably a secondary product formed by decomposing action of beds of lignite and other organic matters which the immense basaltic dykes have penetrated.—On a universal law relative to the dilatation of bodies, by M. Levy, a reply to objections.—On the maturation of the grain of ergot. The substance which plays the part of sugar in this grain, the author finds identical with *synanthrose*, the saccharine matter found in *Synanthreza*, and more especially in Jerusalem artichokes. It is the only saccharine matter present, and it diminishes rapidly in proportion as maturation advances (but

does not wholly disappear), being replaced by starch, formed doubtless at its expense. Wheat, oats, barley, and maize, do not contain synanthrose, but cane-sugar. Thus one may readily detect in flour the fraudulent addition of ergot flour.—On the dangers of the use of methyl alcohol in industry, by M. Poincaré. Animals kept eight to sixteen months in air, ever renewed, but charged with vapours of methyl alcohol, undergo hypertrophy and fatty degeneration of the liver, a like alteration of the muscular fibres of the heart, epithelial cells, uriniferous tubes, and the lung cells, also congestion of the nervous centres, &c.—M. Gelis stated that, owing to large demand, he proposed manufacturing 200,000 kilogrammes of sulphocarbonate of potassium (for phylloxera) for the coming year, and he desired the Academy to obtain from the railway companies reduced prices of transport.—Mr. Warton presented a marine compass with nickel needles.—On the direction of the vertical of Paris Observatory, by M. Gaillot. See first paper.—On a simple property, characterising the mode of distribution of weight of a solid, placed on an elastic horizontal ground, between different parts of its base, when the latter is a horizontal ellipse, by M. Boussinesq.—On certain ordinate series with reference to powers of a variable, by M. Appell.—On the rectification of a class of curves of the fourth order, by M. Darboux.—On an iodised derivative of camphor, by M. Aller. The formula is $C_{10}H_{15}IO$.—On the region of the solar spectrum indispensable to vegetable life, by M. Bert. The part thus necessary to life is that between the lines B and C; but it is not sufficient; for behind red glass plants may live, indeed, long, but they get elongated to excess and slender, with narrow and little-coloured foliar limbs; the blue and violet rays rectify this.—On relations presented by phenomena of motion proper to reproductive organs of some phanerogams with cross and direct fertilisation, by M. Haeckel. Motion provoked in both male and female organs seems to serve physiologically for cross fertilisation, while spontaneous motion assumes direct fertilisation in plants which are not sensibly profited by crossing. The former often characterises the more highly-organised plants, the latter seems proper to the less highly-organised.—Reproduction of felspars by fusion and prolonged maintenance at a temperature near that of fusion, by MM. Fouqué and Levy. The experiments here described were on oligoclase, labrador, and albite.—On two specimens of natural crystals of sulphate of magnesia (epsomite) of remarkable dimensions, by M. De Rouville.

CONTENTS

	PAGE
CLEOPATRA'S NEEDLE AND THE WIND PRESSURE	25
DRAPEN'S SCIENTIFIC MEMOIRS	26
A CATECHISM OF BOTANY	28
OUR BOOK SHELF:—	
Roberts' "Manual of Anthropometry"	29
Muir's "Text-Book of Arithmetic for Use in Higher Class Schools"	30
Blairke's "Elements of Dynamics (Mechanics), with Numerous Examples and Examination Questions"	30
Wilson's "Handbook to Map of the Geographical Distribution of Animals"	30
LETTERS TO THE EDITOR:—	
Gigantic Land Tortoises.—ALEXIS A. JULIEN; Dr. JEFFRIES WYMAN	30
The Figure of the Planet Mars.—H. HENNESSY, F.R.S.	31
The Colour Sense.—GRANT ALLEN	32
Magus's "Hydrostatics" and the "London Science Series"	32
PHILIP MAGNUS; THE REVIEWER	32
The Discovery of a Crannog in Ayrshire.—Dr. F. BUCHANAN WHITE	32
The Power of Stupifying Spiders Possessed by Wasps.—FREDERIC SMITH	32
The Expected Meteor Shower.—W. F. DENNING	33
Geological Climate and Geological Time.—WILLIAM DAVIES	33
A "New Galvanometer"—R. E. BAYNES	33
COMMERCIAL CRISES AND SUN-SOTS. By Prof. W. STANLEY JEVONS, F.R.S.	33
THE WERDERMANN ELECTRIC LIGHT. By T. E. GATEHOUSE (With Illustrations)	37
DUPLEXING THE ATLANTIC CABLE (With Illustrations)	38
THE ROYAL SOCIETY MEDALLISTS	39
AFGHANISTAN	40
OUR ASTRONOMICAL COLUMN:—	
The Solar Eclipse of 1879, July 19	42
Comets of Short Period	42
The Saturnian Satellite Mimas	42
The Minor Planet Ismene	42
GEOGRAPHICAL NOTES	43
NOTES	44
UNIVERSITY AND EDUCATIONAL INTELLIGENCE	46
SOCIETIES AND ACADEMIES	47